



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

Four hundred and eighty-first meeting.

April 24, 1860. — SPECIAL MEETING.

The PRESIDENT in the chair.

The Corresponding Secretary read letters relative to the exchanges of the Academy.

Mr. S. Newcomb read a paper on the secular variations and mutual relations of the orbits of the Asteroids, of which the following is an abstract:—

The tests to which it is possible to put any theory respecting the common origin of the asteroids may be divided into two classes. The one is *per se* demonstrative, and consists in determining by actual trial whether the orbits of the asteroids could ever have fulfilled the conditions which may be required by the hypothesis. It may, however, be subject to practical difficulties in its applications, which impair its demonstrative vigor.

Another method is furnished by the method of probabilities, and might, perhaps, if the asteroids were sufficiently numerous, approach very nearly to certainty in its results. It is founded on the supposition, that the hypothesis examined will imply a high probability of some general relationship among the orbits of the asteroids, if the latter are sufficiently numerous; and consisting in observing whether any such relationship is observable between the elements of the asteroids.

Take, for example, the hypothesis of Olbers. It seems highly probable that, if this hypothesis be true, the fragments of the exploded fragment would have been thrown promiscuously in every direction; and that the velocities of those thrown in one direction would not differ materially from that of those thrown in another. From this hypothesis we easily deduce the following conclusions:—

1. The exploded planet, supposing it to have moved in an orbit with a small eccentricity, was at a distance from the sun about equal to the average distance of the asteroid, or 2.6.

2. The asteroids, of which the mean distance is nearly equal to 2.6, ought on the whole to have much smaller eccentricities than those at a greater or less distance.

3. The eccentricities ought on the whole to be more than twice as great as the inclinations; and the average quantity by which the mean

distance differs from 2.6 should be about 5.2 times the inclination, or 2.4 times the eccentricity.

Now, the orbits of the asteroids are very far indeed from fulfilling either of the last two conditions. The mean value of the eccentricities is almost exactly the same as that of the inclinations, and the variations in the mean distances are much less than they ought to be.

Again, it would seem highly probable, on Olbers's hypothesis, that the smaller fragments would be projected with greater velocities than the large ones, and would thus be found to have larger eccentricities, inclinations, and ranges of mean distance. Such, however, is not found to be the case.

The orbits of the asteroids do not seem to have been materially affected by a resisting medium. Such a medium would affect the smaller ones more than the larger, and thus cause the former to approach the sun more rapidly than the larger. But no tendency among the smaller asteroids to be near the sun is observable, other than what proceeds from the less brilliancy (and consequently less susceptibility of discovery) of the more distant ones.

It has frequently been remarked, that a large majority of the asteroids have their ascending nodes and perihelia in the first semicircle of longitude. This fact throws no light on the question of their origin, since it is the almost necessary effect of known causes. The principal cause is the attraction of Jupiter; and the effect may be expressed by saying that there will always be a tendency in the nodes of the asteroids to coincide with the node of Jupiter, and in the perihelia of the asteroids to coincide with that of Jupiter.

It is possible that the hypothesis that the asteroids were formed by the breaking up of a revolving ring of considerable eccentricity and inclination might account for the general relations of their elements.

Dr. I. I. Hayes, of Philadelphia, addressed the Academy, by special invitation, upon the subject of his proposed expedition to the Arctic Seas. He was introduced by Dr. B. A. Gould, who said:—

More than eighteen months ago, upon the first announcement by Dr. Hayes of his desire to organize an expedition to the North Polar regions to complete the work of the Grinnell expedition under Dr. Kane, resolutions were unanimously passed by this body, commend-

ing his daring and self-sacrificing plans, and offering him the sympathy and influence of the Academy; appointing at the same time a committee of seven Fellows for the purpose of co-operating with him, and of rendering him scientific aid and counsel. The efforts of Dr. Hayes to obtain the equipment for his expedition last year were unsuccessful, and he is now engaged, as the Academy is aware, in renewed efforts to obtain means of conducting a party of exploration to the Arctic Pole, and of thus definitely solving the chief geographical problem of our times,—that of the supposed open Polar Sea, its boundaries, approaches, physical characteristics, and the vegetable and animal inhabitants of its shores and waters.

It may, I think, safely be said, that the great majority of scientific men believe in the existence of such an open sea around the North Pole, for reasons of various kinds, with which the Academy is familiar,—reasons derived from the course of the Gulf Stream, from known habits and habitations of the whales, from the form of the isothermal lines, and from various reports of different explorers since 1810. The evidence brought back by Dr. Kane's expedition tended strongly to corroborate this belief in the public mind; and now, guided by the experience and discoveries of that expedition, Dr. Hayes proposes to aim directly for the Pole, to complete the work so brilliantly begun by the Grinnell expedition, and to secure for our own land the honor which such an enterprise, successfully conducted, cannot fail to receive.

At our last meeting Dr. Hayes was, by a unanimous vote, invited to address the Academy this evening upon the subject so near his heart, and in acceptance of this invitation he is here. He naturally desires to enlist the immediate personal interest of gentlemen present, in behalf of his plans, that their influence may aid him with the community to which he proposes to appeal for help.

Of the feasibility of the exploration, of the extent to which our present experience promises to enable us to surmount difficulties hitherto encountered, of the details of the plan which he has so carefully matured for the equipment of a party and the prosecution of his undertaking, Dr. Hayes will speak. But before taking my seat, I beg leave to urge one important consideration upon the notice of the Academy, namely, the great danger that, if the efforts of Dr. Hayes are unsuccessful in organizing his expedition during the present season, the opportunity may be lost to our country. The Arctic service is ex-

tremely popular in the British navy; a large number of living officers have participated in the searches for Sir John Franklin, and have thus become familiar with the peculiarities of navigation in high latitudes; and at this very time efforts are making on the other side of the Atlantic for exploring these untraversed regions of our own hemisphere. If this expedition be not equipped at present, there is every reason to believe that a European one, next year, upon a larger scale, will supersede it; and that the discoveries and explorations which now reflect such lustre upon the names of Kane and of Grinnell may be thrown into the background by the achievements of those who, while profiting by their experience, may yet overshadow their record. An American expedition ought to be equipped now; and if equipped, who should lead it but Dr. Hayes? What other living citizen unites the experience with the knowledge needed for the enterprise? Those of us who have read his modest narrative of that heroic boat journey towards Upernavik will appreciate that union of chivalry with caution, of daring with discretion, so important for the leader of a hazardous enterprise. They will remember the boldness, the tact, the nerve, and the thoughtfulness which were so conspicuous in that memorable journey.

Dr. Hayes comes to us supported by the commendation of the leading institutions and men of science throughout the land, and bringing their earnest desires for his success in carrying out his heroic aims. His hopes now rest upon Boston, and it remains for our own city to say whether he shall lead his daring company northward.

Permit me now, Mr. President, to introduce Dr. Isaac I. Hayes, surgeon of the late Grinnell expedition under Dr. Kane.

Dr. Hayes then spoke substantially as follows:—

I am highly honored, Mr. President, by the invitation which the Academy has extended to me; and am greatly gratified at having this opportunity to bring to your notice the plan which I have proposed for continuing the researches of the late Dr. Kane. With Dr. Kane's scheme of exploration you are already quite familiar. It was based upon the idea that the great Arctic ice-belt was more readily traversed through Baffin's Bay and Smith Strait than in any other region. He was arrested by the ice at Rensselaer Harbor, in latitude $78^{\circ} 37'$, on the eastern side of Smith Strait. Here he passed the winters of 1853 and 1854. During the summer of 1854 he conducted his explorations

over the ice northward, with sledges ; and finally discovered open water north of the ice-belt. This was traced to latitude 81° , and beyond this point no ice was seen. Dr. Kane's position was an unfavorable one, from causes which will be readily perceived, upon a reference to the map. Smith Strait runs in a northeasterly direction, and diagonally to the general direction of the current which sets south through Kennedy Channel. This current piles the ice upon the Greenland coast, and breaks it into confused ridges ; in consequence of which obstruction, Dr. Kane's parties were greatly embarrassed in their efforts to surmount these hummocks.

I propose to avoid these difficulties by selecting the western shore, where we shall find a protection against the drift-ice ; and, in consequence of this protection, hope to attain to a higher latitude than was attained by Dr. Kane on the opposite side. Along this shore I think it not impossible that, under the protection of the land, it will be possible to penetrate into Kennedy Channel, and through this to find a water communication to the Pole. In any case I feel well assured that the parallel of Cape Frazer, lat. $79^{\circ} 42'$, can be reached, and here a fine harbor can be secured for wintering. Thence northward the coast presents no salient capes to arrest the ice, and we shall doubtless meet a favorable field for our sledge travel. We shall remain mainly inactive during the winter ; but before the earliest return of sunlight in the spring we will push forward our provision depots with dog-sledges, and early in April a boat mounted upon runners will be started. With this equipment we can continue to move northward until we have met the object of our search, when, if such fortune awaits us, we will launch our little vessel and push off directly for the Pole.

That we shall meet the open water, I have no doubt. It may not be found as far south as when discovered by Dr. Kane, (namely, lat. $80^{\circ} 20'$,) for we shall be nearly two months earlier in the season ; but we can readily convey our full equipment over the ice, in the manner already described, as far as latitude 83° , when we shall probably be obliged to await the disruption of the ice.

While these operations are going on, I shall, if found practicable, dispatch parties to the eastward and westward, with the view of completing the survey of the northern coasts of Greenland and Grinnell Land. The region covered by these several parties will be a most important one for scientific surveys. I need not in this presume to

dwell upon the vast importance of the observations which may there be collected, upon the magnetism, meteorology, natural history, and general physics of the globe.

The difficulties which will be encountered are far less than those which have attended Arctic exploration in former years. The experience of the English and American explorers during the last twelve years, while prosecuting the search for Sir John Franklin, has reduced Arctic travel almost to a science. The dogs are a powerful auxiliary, and, by using them almost wholly for draught, I shall be obliged to take only a small number of men. The ice which embarrassed Dr. Kane is readily avoided by avoiding the crossing of Smith Strait. The cold is no longer an obstacle to successful travel. The scurvy, hitherto a great scourge to crews of vessels wintering in the Arctic Seas, is now readily resisted, by the abundant use of such food as can now be readily obtained and preserved quite fresh. From this disease and from all other causes combined, the mortality on board of the vessels which have gone in search of Franklin, during the past twelve years, has been less than three per cent of the whole number of persons engaged.

In concluding, Dr. Hayes thanked the Academy for the courteous hearing which they had given him.

Professor Agassiz expressed himself warmly in favor of the enterprise. It would, if successful, bring to us data which were much needed in almost every department of science. Everything seemed to indicate the existence of an open Polar Sea. The Gulf Stream flowing northward beyond Spitzbergen would carry warm water into the Arctic Basin, and there was every reason to suppose that the bed of the ocean was much depressed in the region of the Pole, and that the existence of land in that quarter was counter-indicated. If there is no land there, it is not probable that there is much ice. In support of his view, that at the centre of the Arctic Ocean the water is very deep, Professor Agassiz called the attention of the Academy to the fact, that the lands investing it are found to descend rapidly from the crests of the great mountain ridges of the northern hemisphere, in both its eastern and western divisions.

If Dr. Hayes could make in those high northern latitudes collections of the lower forms of animal life, they would have exceedingly great value. Indeed, there is scarcely any quarter of the world that would yield richer results to an earnest naturalist.

Professor Agassiz regarded the question as in a certain sense an American one, and thought that since an American, Dr. Kane, had been the first to penetrate to the Polar Sea through Smith Strait, it is the duty of Americans to carry on the work.

Professor Lovering, chairman of the special committee appointed in October, 1858, for the purpose of co-operating with Dr. Hayes, stated that three vacancies had occurred in the committee by death or removal from the State, and moved that these be filled by the chair. This having been done, the committee was announced to consist of the following gentlemen : —

Prof. Joseph Lovering,	Prof. H. L. Eustis,
Hon. Nathan Appleton,	Dr. B. A. Gould, and
Prof. Theophilus Parsons,	Theodore Lyman, Esq.
Edward Wigglesworth, Esq.,	

Professor Lovering then offered the following resolutions, which were unanimously adopted : —

Resolved, That the Academy has heard, with great interest and satisfaction, the development and explanation by Dr. Hayes of his plans for a continuance of the explorations commenced by Dr. Kane, and takes this occasion to renew the expression of its approval and sympathy.

Resolved, That the Academy commends the enterprise proposed by Dr. Hayes to the favor and support of the American people, and most cordially joins in the commendation bestowed upon it by other institutions of science throughout the country.

Resolved, That the committee, hereafter appointed to co-operate with Dr. Hayes, be authorized to take such action as they may deem expedient for promoting the interests of the proposed expedition, and

that they be requested to co-operate with any other committees appointed for a similar purpose.

Professor Agassiz mentioned the fact that Smelts (*Osmerus viridescens*) were about sixty years ago introduced into Jamaica Pond, and that they still exist there in a thriving condition.

A desultory discussion ensued upon some questions relative to the inheritance of acquired habits, and the reversion of feral animals to the original state, in which Professors Bowen, Agassiz, Wyman, Gray, and Dr. Kneeland took part.

On motion of Professor Bowen, it was voted that the special meeting appointed for the 22d of May be held on Tuesday, the first day of May.

Four hundred and eighty-second meeting.

May 1, 1860. — SPECIAL MEETING.

The VICE-PRESIDENT in the chair.

Professor Gray resumed the discussion upon the questions mooted at the preceding meetings, in a rejoinder to Professor Bowen's last remarks.

Premising that he had never accepted the Darwinian theory of the origin of the species as anything more than a legitimate hypothesis, just beginning to stand its trial, and that he had been occupied only in the endeavor to expose and rebut what he thought inconclusive or irrelevant arguments here brought against it, Professor Gray defended and illustrated the positions he had before taken. He maintained that no thoughtful theistic philosopher, and least of all, Professor Bowen, could be justified in charging that a theory of the diversification of species through variation and natural selection was incompatible with final causes or purpose; that the argument for design from structure and adaptation, in the case of any animal, say a dog, took all its validity from the consideration of the animal itself, wholly irrespective of its origin, — was as valid in the instance of an individual dog produced by